

What is claimed is:

1. An apparatus for inspecting a wafer, comprising:
  - a handling unit for supporting, rotating and moving the wafer in horizontal and vertical directions;
  - a first image acquisition unit for acquiring a first image corresponding to an upper surface of the wafer supported by the handling unit;
  - a second image acquisition unit for acquiring a second image, a third image and a fourth image corresponding to a peripheral portion of the upper surface, a side surface and a lower surface of the wafer supported by the handling unit, respectively;
  - a first driving unit for rotating the second image acquisition unit about a peripheral portion of the wafer supported by the handling unit in order to acquiring the second, third and fourth images; and
  - an image processing unit for inspecting defects of the wafer supported by the handling unit from the first to fourth images.
2. The apparatus for inspecting a wafer as claimed in claim 1, wherein the first driving unit is a step motor.

3. The apparatus for inspecting a wafer as claimed in claim 1, wherein the handling unit comprises:

- a chuck for supporting the wafer;
- a second driving unit, connected to the chuck, for rotating the chuck and the wafer;
- a third driving unit, connected to the second driving unit, for moving the chuck and the second driving unit vertically;
- a first plate for supporting the third driving unit; and
- a fourth driving unit, connected to a lower surface of the first plate, for moving the chuck, the second driving unit and the third driving unit horizontally.

4. The apparatus for inspecting a wafer as claimed in claim 3, wherein the second driving unit is a step motor.

5. The apparatus for inspecting a wafer as claimed in claim 3, wherein the third driving unit comprises either a hydraulic cylinder or a pneumatic cylinder.

6. The apparatus for inspecting a wafer as claimed in claim 3, wherein the third driving unit comprises a ball screw type robot.

7. The apparatus for inspecting a wafer as claimed in claim 3, wherein the fourth driving unit comprises a two-axis Cartesian coordinate robot of a ball screw type.

8. The apparatus for inspecting a wafer as claimed in claim 3, wherein the fourth driving unit comprises a first driving robot and a second driving robot.

9. The apparatus for inspecting a wafer as claimed in claim 8, wherein the first driving robot comprises:

a first motor for providing a driving force in an x-axis direction;

a first screw connected to a rotary shaft of the first motor and  
extended in the x-axis direction;

a pair of first ball guides disposed parallel to the first screw on both  
sides;

a first nut coupled with the first screw and moving in the x-axis  
direction by rotation of the first screw; and

a pair of first ball blocks coupled with the pair of first ball guides.

10. The apparatus for inspecting a wafer as claimed in claim 8,  
wherein the second driving robot comprises:

a second motor for providing a driving force in a y-axis direction;

a second screw connected to a rotary shaft of the second motor and  
extended in the y-axis direction;

a pair of second ball guides disposed parallel to the second screw on  
both sides;

a second nut coupled with the second screw and moving in the y-axis  
direction by rotation of the second screw; and

a pair of second ball blocks coupled with the pair of second ball guides.

11. The apparatus for inspecting a wafer as claimed in claim 3, wherein the handling unit further comprises:

a second plate having an opening, the chuck and the second driving unit moving in the vertical direction through the opening;

a plurality of supporting shafts extending from an upper surface of the plate in the vertical direction in order to support the second plate; and

a plurality of supporting pins disposed on an upper surface of the second plate for supporting the wafer while the chuck is placed at a position lower than those of the plurality of supporting pins.

12. The apparatus for inspecting a wafer as claimed in claim 11, wherein each of the plurality of supporting pin has a conical shape and a rounded upper end.

13. The apparatus for inspecting a wafer as claimed in claim 11, further comprising a plurality of alignment pins, movably installed in the horizontal direction at peripheral portions of the second plate, for simultaneously moving the wafer supported by the chuck towards the chuck to align a center of the wafer with a central axis of the chuck.

14. The apparatus for inspecting a wafer as claimed in claim 13, further comprising:

a pair of alignment plates movably disposed on a lower surface of the second plate in the horizontal direction; and

a fifth driving unit disposed on the lower surface of the second plate and operatively connected to the pair of the alignment plates for moving the plurality of alignment pins.

15. The apparatus for inspecting a wafer as claimed in claim 11, further comprising a wafer sensor for sensing the wafer supported by the plurality of supporting pins.

16. The apparatus for inspecting a wafer as claimed in claim 15, wherein the wafer sensor comprises a light sensor having a light emitting portion and a light receiving portion.

17. The apparatus for inspecting a wafer as claimed in claim 1, wherein the first and second image acquisition units comprise:

a light source for illuminating the wafer supported by the handling unit; and

a CCD (charge coupled device) camera for acquiring the images of wafer supported by the handling unit.

18. The apparatus for inspecting a wafer as claimed in claim 1, wherein the first driving unit comprises:

a motor for providing a driving force to rotate the second image acquisition unit and a supporting arm connected to the motor to support the second image acquisition unit so that the second image acquisition unit is placed near the peripheral portion of the wafer supported by the handling unit.

19. The apparatus for inspecting a wafer as claimed in claim 18,  
wherein the supporting arm comprises:

a horizontal arm disposed parallel to a rotary shaft of the motor to  
support the second image acquisition unit and a connecting arm for  
connecting the horizontal arm and the rotary shaft of the motor.

20. The apparatus for inspecting a wafer as claimed in claim 1,  
further comprising:

an inspection chamber for performing a process for inspecting defects  
of the wafer supported by handling unit;

a load chamber connected to the inspection chamber for loading and  
unloading the wafer;

a transfer robot disposed in the load chamber for transferring the  
wafer between a container for receiving a plurality of wafers and the  
inspection chamber; and

a stage connected to the load chamber for supporting the container.



21. The apparatus for inspecting a wafer as claimed in claim 20,  
further comprising:

a mapping sensor electrically connected to the transfer robot for  
sensing positions of the plurality of wafers received in the container.

22. The apparatus for inspecting a wafer as claimed in claim 21,  
wherein the mapping sensor comprises a light emitting portion and a light  
receiving portion.

23. The apparatus for inspecting a wafer as claimed in claim 20,  
further comprising:

a container sensor installed on the stage for sensing the container.

24. The apparatus for inspecting a wafer as claimed in claim 23,  
wherein the container sensor comprises a light emitting portion and a light  
receiving portion.

25. The apparatus for inspecting a wafer as claimed in claim 1,  
further comprising:

a notch sensor for sensing a notch portion of the wafer supported by  
the handling unit and a third image acquisition unit for acquiring an  
identification image corresponding to an identification pattern of the wafer  
supported by the handling unit.

26. The apparatus for inspecting a wafer as claimed in claim 25,  
wherein the notch sensor is a light sensor.

27. The apparatus for inspecting a wafer as claimed in claim 25,  
wherein the third image acquisition unit comprises:

a light source; and

a CCD camera.

28. The apparatus for inspecting a wafer as claimed in claim 25,  
further comprising:

a display unit connected to the image processing unit for displaying the images.

29. The apparatus for inspecting a wafer as claimed in claim 1, further comprising:

a base plate for supporting the handling unit, the first image acquisition unit, the second image acquisition and the driving unit; and

a vibration control unit for supporting the base plate and for controlling a vibration.

30. The apparatus for inspecting a wafer as claimed in claim 1, further comprising:

a central processing unit for controlling operations of the handling unit and the first image acquisition unit in order to acquire the first image, for controlling operations of the handling unit, the second image acquisition unit and the driving unit, and for managing inspection result data of the wafer produced by the image processing unit.

31. An apparatus for inspecting a wafer, comprising:

a chuck for supporting a wafer and for holding the wafer using a vacuum force;

a first driving unit connected to a lower surface of the chuck for rotating the wafer held by the chuck;

a three-axis Cartesian coordinate robot for moving the wafer held by the chuck in horizontal and vertical directions;

a first image acquisition unit for acquiring a first image corresponding to an upper surface of the wafer held by the chuck;

a second image acquisition unit for acquiring a second image, a third image and a fourth image corresponding to a peripheral portion of the upper surface, a side surface and a lower surface of the wafer held by the chuck, respectively;

a second driving unit for rotating the second image acquisition unit about a peripheral portion of the wafer held by the chuck in order to acquiring the second, third and fourth images;

a supporting arm for supporting the second image acquisition unit and for connecting the second image acquisition unit and the second driving unit

so that the second image acquisition unit is placed near the peripheral portion of the wafer held by the chuck; and

an image processing unit for inspecting defects of the wafer held by the chuck from the first to fourth images.

32. The apparatus for inspecting a wafer as claimed in claim 31, wherein the three-axis Cartesian coordinate robot comprises:

a third driving unit connected with the first driving unit for moving the wafer held by the chuck in the vertical direction;

a first plate for supporting the third driving unit;

a two-axis Cartesian coordinate robot for supporting the first plate and for moving the wafer by the chuck in the horizontal direction;

a second plate disposed over the first plate and having a opening so that the first driving unit moves through the opening;

a plurality of supporting shafts for supporting the second plate, the plurality of supporting shafts extending from a upper surface of the first plate in the vertical direction; and

a plurality of alignment pins, movably installed in the horizontal direction at peripheral portions of the second plate, for simultaneously moving the wafer supported by the chuck towards the chuck in order to align a center of the wafer with a central axis of the chuck.

33. The apparatus for inspecting a wafer as claimed in claim 31, wherein the supporting arm comprises:

a horizontal arm disposed in parallel with a rotary shaft of the second driving unit for supporting the second image acquisition unit and a connecting arm for connecting the horizontal arm and the rotary shaft of the second driving unit.